Certificate

I, Yuko Yagi, a member of Hayase & Company patent attorneys of 13F, NISSAY SHIN-OSAKA Bldg., 3-4-30, Miyahara, Yodogawa-ku, Osaka-shi, Osaka 532-0003 Japan, hereby certify that to the best of my knowledge and belief the following is a true translation into English made by me of the Japanese Patent Application 11-183738 filed on June 29, 1999 by Matsushita-kotobuki Electric Industries., Ltd.

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[Title of Invention] OPTICAL DISK DEVICE

[Claims]

[Claim 1] An optical disk device for recording/reproducing data on/from an optical disk, comprising:

a monitor circuit for monitoring a junction temperature of a chip of a driver IC;

a comparison circuit for comparing the relation of the junction temperature of the chip monitored by the monitor circuit with an arbitrary set temperature and outputting a temperature flag as a comparison result, which circuits are included in the driver IC; and

a CPU for controlling the operation of the entire optical disk device as well as monitoring the temperature flag outputted from the comparison circuit to confirm a febrile state in the driver IC, said CPU performing a control so as to continue driving of the optical disk device when the junction temperature is lower than the arbitrary set temperature, and performing a control so as to suppress heat generation of the driver IC when the junction temperature is equal to or higher than the arbitrary set temperature.

[Claim 2] The optical disk device as defined in Claim 1 wherein

a control for suppressing heat generation of the driver IC is performed by at least one of a control in which a free

run state of the optical disk is included in changes in revolution of the disk, a control in which a forced acceleration or forced deceleration of the disk is not performed for an arbitrary period of time, and a control in which the number of revolutions of the disk is reduced.

[Claim 3] The optical disk device as defined in Claim 1 wherein

the monitor circuit and the comparison circuit are included in at least one of spindle driver IC, a traverse driver IC, and an actuator driver IC.

[Detailed Description of the Invention]

[0001]

[Applicable Field in the Industry]

The present invention relates to an optical disk device and, more particularly, to a device that controls heat generation of a driver IC.

[0002]

[Prior Art]

In the past several years, speeding-up of optical disk devices has proceeded, and 12x-speed CLV (Constant Linear Velocity) drives and maximum-24x-speed CAV (Constant Angular Velocity) drives have come along. With this speeding-up, allowable losses from heat become insufficient in conventional driver ICs such as spindle driver ICs, actuator driver ICs and traverse driver ICs, and this problem is dealt with by adding

a heat dissipating plate or the like to a driver IC to control heat generation of the driver IC, arranging an air blowing means at an optical disk driving part to control heat generation as disclosed in Japanese Published Patent Application No. Hei.9-265772, or employing a pattern design with a high heat radiation efficiency in PCB design, and in the case of eccentric disk, by adopting a method of reducing the number of revolutions of the disk or the like.

[0003]

Further, when there are constraint conditions on the driver IC, the heat dissipating plate cannot be added and thus heat generation or the like cannot be suppressed, and thus this problem is dealt with by using a driver IC of power package specifications whose allowable loss from heat is large or preventing the disk from being rotated at high speed.

[0004]

In a case where the allowable loss of the driver IC due to heat is exceeded even though the above-described measures for suppressing heat generation are taken, in order to prevent the resultant breakdown of the driver IC or the like, the driver IC is provided with a thermal shutdown function, whereby the operation of the driver IC is stopped forcibly when the junction temperature as a chip temperature of the driver IC reaches a predetermined temperature.

[0005]

[Problems to be solved by the invention]

When speeding-up of the optical disk device is to be further progressed in the future, in partially eccentric disks or the like, it is required that the acceleration sensitivity of an actuator in a pickup should be increased more than ever, and face wobbling or eccentricity of a disk results in a severe heat generation of an actuator driver IC. Further, due to speeding-up of the optical disk device, the change in the number of revolutions of the disk also becomes larger, and heat generation in a spindle driver IC due to repetition of forced acceleration or forced deceleration of a spindle motor, or heat generation in a traverse driver IC due to high-speed movement of a traverse (thread) becomes severe.

[0006]

Accordingly, the allowable loss of the conventional driver IC due to heat is insufficient, resulting in breakage of the driver IC. When the driver IC is provided with the thermal shutdown function, the driver IC can be protected from breakage due to heat generation, but the optical disk device becomes uncontrollable while the thermal shutdown function is being operated.

[0007]

The present invention has for its object to provide an optical disk device which can exert a control for efficiently suppressing heat generation before driving of the optical disk

device is impeded by monitoring heat generation state of the driver IC, and can perform an operation as fast as possible and as stable as possible within an allowable loss of the driver IC.

[0008]

[Measures to Solve the Problems]

In order to achieve the objects, an optical disk device according to Claim 1 for recording/reproducing data on/from an optical disk, comprises: a monitor circuit for monitoring a junction temperature of a chip of a driver IC; a comparison circuit for comparing the relation of the junction temperature of the chip monitored by the monitor circuit with an arbitrary set temperature and outputting a temperature flag as a comparison result, which circuits are included in the driver IC; and a CPU for controlling the operation of the entire optical disk device as well as monitoring the temperature flag outputted from the comparison circuit to confirm a febrile state in the driver IC, said CPU performing a control so as to continue driving of the optical disk device when the junction temperature is lower than the arbitrary set temperature, and performing a control so as to suppress heat generation of the driver IC when the junction temperature is equal to or higher than the arbitrary set temperature.

[0009]

According to the optical disk device of Claim 2, in the

optical disk device as defined in Claim 1, a control for suppressing heat generation of the driver IC is performed by at least one of a control in which a free run state of the optical disk is included in changes in revolution of the disk, a control in which a forced acceleration or forced deceleration of the disk is not performed for an arbitrary period of time, and a control in which the number of revolutions of the disk is reduced.

[0010]

According to the optical disk device of Claim 3, in the optical disk device as defined in Claim 1, the monitor circuit and the comparison circuit are included in at least one of spindle driver IC, a traverse driver IC, and an actuator driver IC.

[0011]

[Embodiments]

(Embodiment 1)

Figure 1 is a block diagram illustrating a first embodiment of the present invention. As shown in the figure, the optical disk device in the first embodiment comprises a disk 1, a spindle motor 2 for rotating the disk 1, an object lens 3 for detecting data on the disk 1, a pickup 4 which slightly moves the object lens 3 and controls the same, an Optical amp 5 as an optical amplifier, a traverse motor 6 for moving the pickup 4 in a radial direction of the disk 1, a spindle driver IC 7

as an IC for driving the spindle motor 2, a traverse driver IC 8 as an IC for driving the traverse motor 6, an actuator driver IC 9 as an IC for driving the actuator of the pickup 4, a DSP (Digital Signal Processor) 10 for performing servo control as well as controlling the spindle driver IC 7 and the actuator driver IC 9, a CPU 11 which exerts a control of the whole device as well as monitors the heat generation states of the spindle driver IC 7, the traverse driver IC 8, and the actuator driver IC 9to exert a control so as to suppress heat generation, monitor circuits 12a, 12b and 12c for monitoring junction temperatures of the respective driver IC chips, and comparison circuits 13a, 13b and 13c for comparing the junction temperatures of the respective chips monitored by the monitor circuits 12a, 12b and 12c with respective arbitrarily set temperatures to output temperature flags as comparison results.

[0012]

Next, the operation will be described. In figure 1, the junction temperatures of the respective chips of the spindle driver IC 7, the traverse driver IC 8 and the actuator driver IC 9 are monitored in the monitor circuits 12a, 12b and 12c in the driver ICs 7, 8 and 9, respectively, the monitored temperatures are compared with respective arbitrarily set temperatures in the comparison circuits 13a, 13b and 13c provided in the driver ICs 7, 8 and 9, respectively, and the

comparison results are outputted to the CPU 11 as the temperature flags. Here, the above-described arbitrary temperatures are set in consideration of an allowable range of losses of the respective driver ICs 7, 8 and 9 due to heat. Further, when the respective driver ICs 7, 8 and 9 are provided with the thermal shutdown function, the arbitrary temperatures can be set on the basis of the conditions such as the set operating temperatures of the respective driver ICs.

[0013]

The CPU 11 monitors the temperature flags outputted from the comparison circuits 13a, 13b and 13c. When the driver ICs have higher temperatures than the respective arbitrarily set temperatures, a control signal is outputted to the DSP 10 so that the driver ICs 7, 8 and 9 do not generate heat any more, respectively. The DSP 10 performs a control of the revolution of the disk 1 together with the CPU 11, for example, a control in which a free run state of the disk 1 is included in changes in revolution of the disk 1, a control in which forced acceleration or forced deceleration of the disk 1 is not performed for an arbitrary period of time, and a control in which the number of revolutions of the disk 1 is reduced.

[0014]

As described above, in the first embodiment, when the optical disk device is driven, the junction temperatures of the respective driver ICs 7, 8 and 9 are monitored by the monitor

circuits 12a, 12b and 12c in the respective driver ICs 7, 8 and 9, the comparison circuits 13a, 13b and 13c compare the junction temperatures of the respective chips with arbitrarily set temperatures, the temperature flags as the comparison results are outputted to the CPU 11. Therefore, the CPU 11 can confirm febrile states of the respective driver ICs 7, 8 and 9. Further, the CPU 11 monitors the febrile state of the respective driver ICs 7, 8 and 9, thereby performing a control so as to suppress heat generation of the respective driver ICs 7, 8 and 9 effectively, and obtaining an as fast as possible and stable performance within a range of an allowable losses of the respective driver ICs 7, 8 and 9.

[0015]

While in the first embodiment the description is given of the case where the optical disk device has the monitor circuit 12 and the comparison circuit 13 in each of the spindle driver IC 7, the traverse driver IC 8 and the actuator driver IC 9, the optical disk device may have the monitor circuit 12 and the comparison circuit 13 in at least one of the driver ICs 7, 8 and 9. Also in this case, almost the same effects as described above are achieved.

[0016]

[Effect of the Invention]

As described above, according to the optical disk device of the present invention, the junction temperatures of the

respective driver ICs are monitored by the monitor circuits in the respective driver ICs, the comparison circuits compare the junction temperatures of the respective chips monitored by the monitor circuits with arbitrarily set temperatures, the temperature flags as the comparison results are outputted to the CPU 11. Therefore, the CPU 11 can confirm febrile states of the respective driver ICs. Further, the CPU 11 monitors the febrile state of the respective driver ICs, thereby performing a control so as to suppress heat generation of the respective driver ICs effectively, and obtaining an as fast as possible and stable performance within a range of an allowable losses of the respective driver ICs 7, 8 and 9.

[Brief description of the Drawings]

[Figure 1]

Figure 1 is a block diagram illustrating a first embodiment of the present invention.

[Description of the Reference Numerals]

1...disk

2...spindle motor

3...object lens

4...pickup

5...Optical amp

6...traverse motor

7...spindle driver IC

8...traverse driver IC

9...actuator driver IC

10...DSP (digital signal processor)

11...CPU

12a,12b,12c...monitor circuit

13a,13b,13c...comparison circuit

[Name of the Document] Abstract

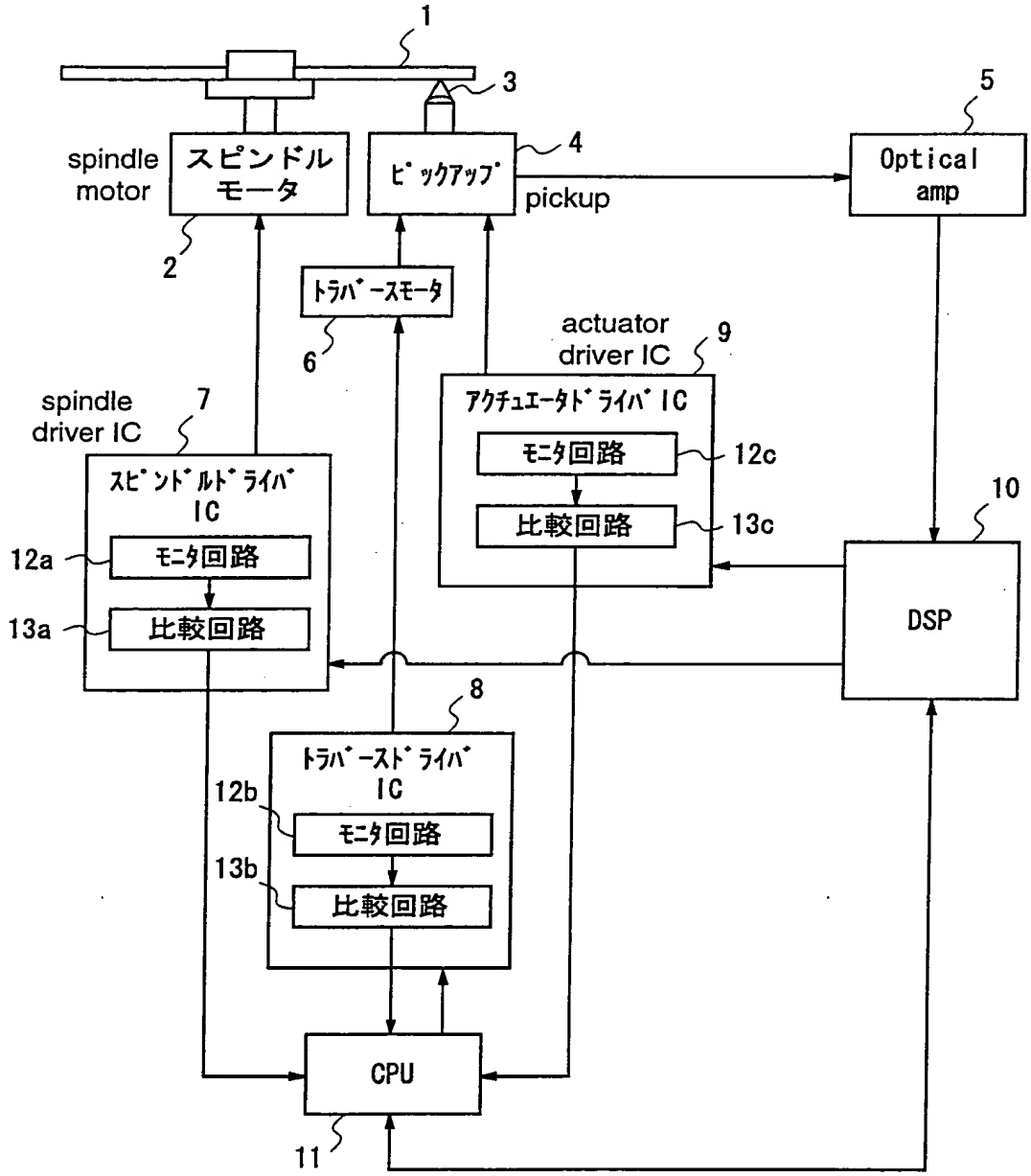
[Summary]

[Object] There is provided an optical disk device which can perform a control so as to effectively suppress heat generation in the driver ICs and can obtain an as fast as possible and stable performance within allowable capacities of the driver ICs.

[Construction] Monitor circuits for monitoring junction temperatures of chips of driver ICs; and comparison circuits for comparing the junction temperatures with respective arbitrarily set temperatures to output temperature flags as comparison results are included in the driver ICs, and a CPU 11 monitors the temperature flags to confirm febrile states of the respective driver ICs, thereby performing a control so as to continue to drive an optical disk device when the junction temperatures of the chips of the driver ICs are lower than the set temperatures, and to suppress heat generation of the respective driver ICs when the temperatures are equal to or higher than the set temperatures.

[Selected Figure] Figure 1

Name of Document
【書類名】 図 面 Drawing
【図1】 Figure 1



6 : traverse motor
8 : traverse driver IC
12a,12b,12c : monitor circuit
13a,13b,13c : comparison circuit